Commonwealth
of Massachusetts

Deval L. Patrick
Governor

Timothy P. Murray
Lieutenant Governor

JudyAnn Bigby, M.D.
Secretary
Executive Office of Health
and Human Services

Seena Perumal Carrington
Acting Commissioner
Division of Health Care
Finance and Policy

Massachusetts Health Care Cost Trends

Price Variation in Health Care Services

Technical Appendix

May 2011

Revised June 3, 2011

DIVISION OF
Health Care
Finance and Policy

Table of Contents

1. Inpatient Price Variation

The analyses of hospital inpatient price variation utilized medical claims data from five private carriers representing about 79 percent of privately insured lives in Massachusetts. The file was limited to claims for inpatient care in Massachusetts acute care hospitals for Massachusetts residents with private comprehensive health insurance coverage. Inpatient records were rolled up to the claims level and then filtered to retain only the most recent version in cases where there were duplicate claims.

Additional filters were applied to the claims data to remove aberrant data, as described in Table 1. Inpatient claims were then grouped into diagnosis-related groups (DRGs) and severity of illness (SOI) subclasses using the 3M APR DRG Classification System, version 24.0. For this analysis, fourteen common DRGs which are provided at both community and teaching hospitals were selected. Number of discharges (based on DHCFP's hospital discharge data) and total payments (based on the claims data) were also considered in order to include DRGs that were high-volume. The DRGs and associated age restrictions applied for the analysis are reported in Table 2.

Table 1: Inpatient Claims Filtering Rules

	Filtering rule from HCQCC specifications	Modifications to HCQCC filter
1a.	Dates of discharge must be between July 1, 2008 and June 30, 2009. Claims paid thru 12/31/09.	Dates of discharge must be between January 1, 2009 and December 31, 2009. Claims paid thru 6/31/10
1b.	Remove any records where discharge date is less than admission date.	No change
1c.	Remove discharges with length of stay beyond 35 days which is beyond the 99.9th percentile.	No change
2.	Remove Kindred Hospitals and other non-Massachusetts hospitals (Hospital ID 135 & 136).	Kindred hospitals were removed from the file prior to applying filtering steps. Removed non-Massachusetts hospitals
3.	Exclude claims with product codes that are Medicare- and Medicaid-related by keeping Product codes 12, 13, and HM only.	Medicare and Medicaid products were removed from the file prior to applying filtering steps
4.	Remove any records that do not have at least one claim service line paid as primary	Retain records where Claim Status = 1 (processed as primary)
5.	Remove any records where the total of plan paid amount plus prepaid plus member responsibility is negative or zero.	No change
6.	Retain only the selected condition or procedure codes.	No change (see Table 2 for description of DRGs)
7.	Limit to patients age 18 and over for hearts, strokes, hip fracture, hip replacement, pneumonia, COPD but accept all patient ages for the other conditions and procedures.	No change (see Table 2 for description of DRGs and age restrictions)

Table 2: DRGs and Associated Age-Restrictions for Analysis

Diagnosis-Related Group (DRG)	Age Restriction (condition from step 7)
Laparascopic cholecystectomy (263)	All ages
Procedures for obesity (403)	All ages
Uterine and adnexa procedures for non-malignancy except leiomyoma (513)	All ages
Appendectomy (225)	All ages
Knee joint replacement (302)	All ages
Intervertebral disc excision and decompression (310)	All ages
Knee and lower leg procedures (313)	All ages
Hip joint replacement (301)	Ages 18+
Chronic obstructive pulmonary disease (COPD) (140)	Ages 18+
Pneumonia (139)	Ages 18+
Acute Myocardial Infarction (AMI) (190)	Ages 18+
Congestive Heart Failure (CHF) (194)	Ages 18+
Cesarean delivery (540)	All ages
Vaginal delivery (560)	All ages

Outlier observations were removed at both the top and bottom of the price distribution for each DRG using a step-wise procedure. At the top of the distribution, prices above the 90th percentile for each DRG were searched sequentially upwards until an upper-bound was set or the maximum price was reached. The upper-bound (if any) was set as $1.2 * P_i$ if the ratio of P_{i+1} to P_i exceeded 1.5. All claims with payments above the upper-bound were discarded. A similar step-wise procedure was used to eliminate outliers at the bottom of the distribution, starting at the 10th percentile and searching downwards through each percentile until a lower-bound was set or the minimum price was reached. The lower-bound (if any) was set as $0.8*P_i$ if the ratio of P_i to P_{i-1} was greater than 1.5.

After eliminating outliers, the price variation analysis was based on three different methods: (1) the statewide distribution of payments, (2) severity-adjusted prices, and (3) hospital specific price relativities.

Statewide Distribution

The statewide distribution of actual payments for all discharges, regardless of which hospital provided the service, was considered in displaying the range of prices in Section 1.1 of the report. Payments for discharges associated with SOIs with less than five discharges were excluded, and the minimum, mean, median, and maximum prices for each DRG and SOI combination were calculated across all hospitals.

Potential Savings Models

To simulate potential savings for the models to reduce price variation considered in Section 1.5, percentiles were calculated on the statewide distribution of actual payments for all discharges, and savings were modeled when payment levels were respectively set to the median price, constrained below the 80th percentile, raised to at least the 20th percentile, or established between a floor at the 20th percentile and a ceiling at the 80th percentile. In order to account for price variation due to SOI, these calculations were performed separately by SOI and the resulting savings were summed to arrive at a single estimate of savings for each DRG. This method yielded an estimate of the percent change in health care expenditures for each health service analyzed and under each scenario, as well as a percent change across all 14 DRGs.

In order to compute estimated total savings in dollars for inpatient services, these results were extrapolated to all carriers and all DRGs. It was assumed that the DRGs included in the analysis (which account for approximately 32 percent of all inpatient expenditures in 2009) were representative of all inpatient DRGs in 2008. Information on 2008 expenditures was obtained from DHCFP's prior analysis of health care cost trends, which estimated total expenditures of $13 billion by carriers (and their enrollees) representing 65 percent of the market.[1] The same report found that inpatient expenditures represented 17 percent of total private payer expenditures in 2008. Extrapolating $13 billion to the entire market yielded an estimate of total private expenditures equal to $20 billion ($13 billion/0.65) in 2008. Total inpatient expenditures were then estimated as $3.4 billion ($20 billion * 0.17).

The $3.4 billion estimated total inpatient expenditures were multiplied by the projected percent change in inpatient expenditures in order to arrive at dollar estimates of projected savings. Since this method used 2009 data to estimate a percent change in expenditures and applied this percent change to spending from 2008, the estimated savings presented are likely conservative, compared with estimated savings that would be obtained using 2009 spending.

1 See Figure A.2 in Deborah Chollet, et al., *Massachusetts Health Care Cost Trends, Part III: Health Spending Trends for Privately Insured 2006-2008*, February 2010. Available at: http://www.mass.gov/Eeohhs2/docs/dhcfp/r/cost_trends_files/part3_health_spending_trends_technical_report.pdf, accessed 5/22/2011.

Severity-adjusted prices

Severity-adjusted prices were calculated for the hospital-specific analyses presented in Section 1.2 of the report. In general, the calculation of severity-adjusted prices followed the same methodology as the Massachusetts Health Care Quality and Cost Council (HCQCC) for calculating severity-adjusted prices.[2] To calculate severity-adjusted prices per DRG per hospital, the number of discharges for each SOI per DRG per hospital was calculated, and this information was merged onto the claims-level data by hospital ID.

Hospitals with fewer than 30 observations were omitted entirely from the input data file, as were DRG-SOI combinations with less than five discharges. The distribution of discharges by SOI was calculated for each DRG and hospital. For each hospital and DRG, three calculations were made:

A = The hospital's weighted average median price was calculated as the average of the hospital's median prices within each SOI weighted by the hospital's number of discharges per SOI.

B = The hospital's expected median price per DRG was calculated as a weighted average of the statewide median prices by SOI and DRG, with the weights calculated as the hospital-specific number of discharges by SOI for that DRG.

C = The statewide median was calculated across SOIs with at least five observations in hospitals with at least 30 observations of the DRG.

Each hospital's severity-adjusted median price was then calculated as (A/B)*C. The use of A in the numerator (versus the hospital simple median) ensured that a hospital's severity-adjusted median price would equal its actual median price, if its distribution of severity and prices equaled the statewide distribution.

Price Relativities

For each of the 14 DRGs, hospitals were arrayed by their severity-adjusted median prices to identify the median hospital. The severity-adjusted median price of each hospital was then divided by the severity-adjusted median price of the median hospital to create a price index, referred to as a *price relativity.* This approach is used in Sections 1.3 and 1.6 of the report in order to allow hospitals to be compared directly on prices, adjusted for severity.

2 See Health Care Quality and Cost Council, MyHealthCareOptions website, "About the Ratings." Available at: http://hcqcc.hcf.state.ma.us/Content/AboutTheRatings.aspx, accessed 5/01/2011.

Classification of Hospitals

For the analysis presented in Section 1.2, hospitals were classified as follows:

- "Tertiary care hospitals" - Hospitals that offer both cardiovascular surgery and neurosurgery, a definition used by the Dartmouth Atlas in constructing Hospital Referral Regions (HRRs). All but one of these facilities in Massachusetts also has an intermediate or neonatal intensive care unit (NICU).
- "Specialty and other teaching hospitals" - Facilities that are major teaching hospitals but do not offer both cardiovascular surgery and neurosurgery
- "Community hospitals" - All other hospitals

Table 3 compares this year's classification with the classification used in DHCFP's 2010 analysis of health care cost trends.[3]

Table 3: Tertiary Care, Specialty, And Other Non-Teaching Hospitals

New Classification	Classification in DHCFP's 2010 Cost Trends report	Number of Hospitals	Hospital Names
Tertiary Care Hospital	Teaching Hospital	11	Baystate Medical Center Beth Israel Deaconess Medical Center Boston Medical Center Brigham & Women's Hospital Caritas St. Elizabeth's Medical Center Lahey Clinic Massachusetts General Hospital Mount Auburn Hospital Saint Vincent Hospital Tufts Medical Center U Mass Medical Center—University Campus
	Non-Teaching Hospital	4	Beth Israel Deaconess Hospital—Needham Cape Cod Hospital North Shore Medical Center/Salem Hospital Southcoast Health Systems—Charlton
Specialty or Other Teaching Hospital	Teaching Hospital	7	Children's Hospital Dana Farber Cancer Institute Mass Eye & Ear Infirmary U Mass Medical Center—Memorial Campus Cambridge Health Alliance—Cambridge Hospital Cambridge Health Alliance—Somerville Hospital Cambridge Health Alliance—Whidden Memorial Hospital
Community Hospital	Non-Teaching Hospital	53	All other hospitals

3 Massachusetts Division of Health Care Finance and Policy, *Massachusetts Health Care Cost Trends, Part III: Health Spending Trends for Privately Insured 2006-2008*, February 2010. Available at: http://www.mass.gov/Eeohhs2/docs/dhcfp/r/cost_trends_files/part3_exec_sum_health_spending_trends.pdf, accessed 5/22/2011.

"Boston Metro Area Hospitals" - These hospitals are located in the Boston Emergency Medical Services (EMS) region and include:

Brigham & Women's Hospital	Mass Eye and Ear Infirmary
Children's Hospital	Faulkner Hospital
Dana Farber Cancer Institute	Caritas Carney Hospital
Massachusetts General Hospital	Marlborough Hospital
South Shore Hospital	Metrowest Medical Center Leonard Morse
Beth Israel Deaconess Medical Center	New England Baptist Hospital
Caritas St. Elizabeth's Medical Center	Newton Wellesley Hospital
Mount Auburn Hospital	Quincy Medical Center
Beth Israel Deaconess Hospital Needham	Winchester Hospital
Boston Medical Center	Milton Hospital
Lahey Clinic	Caritas Norwood
Tufts Medical Center	Emerson Hospital
Cambridge Health Alliance – Cambridge	Metrowest Medical Center Framingham
Cambridge Health Alliance – Somerville	

2. Professional Services Price Variation Analyses

Before conducting any analyses on the professional services claims, the dataset was limited to claims with valid current procedural terminology (CPT) codes, paid on a fee-for-service basis, and corresponding to a non-zero and non-negative payment amount. Twenty CPT codes were selected for analysis, reflecting a high volume of services and payments across a range of service types. These CPT codes were evaluated to understand the extent to which claims were coded with modifiers indicating that the claim reflected only the professional component, only the technical component, or both. Table 4 shows the distribution of modifiers by type for each of the 20 selected CPT codes.

Table 4: Type and Number of Modifiers for Selected Service Types (continued on next page)

Evaluation and management				
CPT Code	**Description/modifiers**	**N**	**%**	**Cumulative %**
99213	E&M: Office or other outpatient visit for the evaluation and management of an established patient, low complexity			
	No modifier	1,077,950	83.40%	83.40%
	26: professional component	514	0.00%	83.40%
	TC: technical component	7	0.00%	83.40%
	Other modifiers	214,605	16.60%	100.00%
99214	Office or other outpatient visit for the evaluation and management of an established patient, moderate complexity			
	No modifier	496,430	83.60%	83.60%
	26: professional component	279	0.00%	83.60%
	TC: technical component	0	0.00%	83.60%
	Other modifiers	97,130	16.40%	100.00%
99396	Periodic comprehensive preventive medicine reevaluation and management, established patient 40-64 years of age			
	No modifier	143,441	80.90%	80.90%
	26: professional component	30	0.00%	80.90%
	TC: technical component	0	0.00%	80.90%
	Other modifiers	33,817	19.10%	100.00%
99244	Office consultation for a new or established patient, moderate/high complexity			
	No modifier	68,131	83.40%	83.40%
	26: professional component	23	0.00%	83.40%
	TC: technical component	1	0.00%	83.40%
	Other modifiers	13,527	16.60%	100.00%
General medicine				
CPT Code	**Description/modifiers**	**N**	**%**	**Cumulative %**
90806	Individual psychotherapy, insight oriented, behavior modifying and/or supportive, in an office or outpatient facility, approximately 45 to 50 minutes face-to-face with the patient			
	No modifier	572,282	83.50%	83.50%
	26: professional component	563	0.10%	83.60%
	TC: technical component	1	0.00%	83.60%
	Other modifiers	112,495	16.40%	100.00%
92014	Ophthalmological services: medical examination and evaluation, with initiation or continuation of diagnostic and treatment program; comprehensive, established patient, 1 or more visits			
	No modifier	100,108	98.10%	98.10%
	26: professional component	0	0.00%	98.10%
	TC: technical component	1	0.00%	98.10%
	Other modifiers	1,980	1.90%	100.00%
90807	Individual psychotherapy, insight oriented, behavior modifying and/or supportive, in an office or outpatient facility, approximately 45 to 50 minutes face-to-face with the patient; with medical evaluation and management services			
	No modifier	92,108	96.50%	96.50%
	26: professional component	0	0.00%	96.50%
	TC: technical component	0	0.00%	96.50%
	Other modifiers	3,365	3.50%	100.00%

Table 4: Type and Number of Modifiers for Selected Service Types (continued from previous page)

Physical medicine				
CPT Code	Description/modifiers	N	%	Cumulative %
97110	Therapeutic procedure, one or more areas, each 15 minutes; therapeutic exercises to develop strength and endurance, range of motion and flexibility			
	No modifier	475,470	81.20%	81.20%
	26: professional component	31	0.00%	81.20%
	TC: technical component	0	0.00%	81.20%
	Other modifiers	109,936	18.80%	100.00%
97140	Manual therapy techniques (e.g., mobilization/ manipulation, manual lymphatic drainage, manual traction), one or more regions, each 15 minutes			
	No modifier	269,221	69.40%	69.40%
	26: professional component	1	0.00%	69.40%
	TC: technical component	0	0.00%	69.40%
	Other modifiers	118,556	30.60%	100.00%
98940	Chiropractic manipulative treatment (CMT); spinal, 1-2 regions			
	No modifier	266,723	97.40%	97.40%
	26: professional component	313	0.10%	97.50%
	TC: technical component	0	0.00%	97.50%
	Other modifiers	6,815	2.50%	100.00%
Radiology				
CPT Code	Description/modifiers	N	%	Cumulative %
70553	Magnetic resonance (e.g., proton) imaging, brain (including brain stem); without contrast material, followed by contrast material(s) and further sequences			
	No modifier	109	1.00%	1.00%
	26: professional component	10,144	88.70%	89.60%
	TC: technical component	1,180	10.30%	100.00%
	Other modifiers	4	0.00%	100.00%
73721	Magnetic resonance (e.g., proton) imaging, any joint of lower extremity; without contrast material			
	No modifier	224	1.40%	1.40%
	26: professional component	13,434	83.30%	84.70%
	TC: technical component	2,189	13.60%	98.30%
	Other modifiers	282	1.70%	100.00%
74160	Computed tomography, abdomen; with contrast material(s)			
	No modifier	69	0.30%	0.30%
	26: professional component	21,464	92.60%	92.90%
	TC: technical component	1,631	7.00%	100.00%
	Other modifiers	4	0.00%	100.00%
71020	Radiologic examination, chest, 2 views, frontal and lateral			
	No modifier	829	0.80%	0.80%
	26: professional component	90801	88.90%	89.80%
	TC: technical component	10425	10.20%	100.00%
	Other modifiers	28	0.00%	100.00%

Table 4: Type and Number of Modifiers for Selected Service Types (continued from previous page)

Surgery				
CPT Code	Description/modifiers	N	%	Cumulative %
59400	Routine obstetric care including antepartum care, vaginal delivery (with or without episiotomy, and/or forceps) and postpartum care			
	No modifier	5153	97.30%	97.30%
	26: professional component	0	0.00%	97.30%
	TC: technical component	0	0.00%	97.30%
	Other modifiers	141	2.70%	100.00%
45378	Colonoscopy, flexible, proximal to splenic flexure; diagnostic, with or without collection of specimen(s) by brushing or washing, with or without colon decompression (separate procedure)			
	No modifier	13,269	87.10%	87.10%
	26: professional component	0	0.00%	87.10%
	TC: technical component	0	0.00%	87.10%
	Other modifiers	1,960	12.90%	100.00%
43239	Upper gastrointestinal endoscopy including esophagus, stomach, and either the duodenum and/or jejunum as appropriate; with biopsy, single or multiple			
	No modifier	9,881	73.80%	73.80%
	26: professional component	0	0.00%	73.80%
	TC: technical component	0	0.00%	73.80%
	Other modifiers	3,500	26.20%	100.00%
11100	Biopsy of skin, subcutaneous tissue and/or mucous membrane (including simple closure), unless otherwise listed; single lesion			
	No modifier	16,868	72.10%	72.10%
	26: professional component	1	0.00%	72.10%
	TC: technical component	0	0.00%	72.10%
	Other modifiers	6,534	27.90%	100.00%
20610	Arthrocentesis, aspiration and/or injection; major joint or bursa (e.g., shoulder, hip, knee joint, subacromial bursa)			
	No modifier	15,522	64.00%	64.00%
	26: professional component	1	0.00%	64.00%
	TC: technical component	0	0.00%	64.00%
	Other modifiers	8,714	36.00%	100.00%
29881	Arthroscopy, knee, surgical; with meniscectomy (medial OR lateral, including any meniscal shaving)			
	No modifier	1,496	58.40%	58.40%
	26: professional component	0	0.00%	58.40%
	TC: technical component	0	0.00%	58.40%
	Other modifiers	1,065	41.60%	100.00%

Based on the analysis of modifiers, only claims with no modifiers were retained for evaluation and management, general medicine, and physical medicine CPT codes. Only claims with professional modifiers were retained for radiology CPT codes. For surgery CPT codes 29881 and 20610, modifiers that indicated whether surgery was conducted on the left side or right side were ignored; surgery CPT claims were retained only if they had no other modifiers.

Outliers at the top and bottom of the distribution of payments for each CPT code were eliminated using the same stepwise procedure as was applied to inpatient claims. Starting at the 90th percentile of the price distribution for each CPT code, claims were searched upwards until an upper-bound was set or the maximum price was reached. The upper-bound (if any) was set as 1.2 * P_i if the ratio of P_{i+1} to P_i was greater than 1.5. All claims with payments above the upper-bound were discarded. A similar procedure was followed to eliminate outliers at the bottom of the distribution. Starting at the 10th percentile of prices, claims were searched downwards until a lower-bound was set or the minimum price was reached. The lower-bound (if any) was set as 0.8*P_i if the ratio of P_i to P_{i-1} was greater than 1.5.

Potential Savings Models

For each CPT code, the total number of claims and total payments were calculated, as well as the minimum, mean, median and maximum prices. The analysis presented in Section 2.1 was based on this analysis of the statewide distribution of all claims by CPT code, similar to the inpatient analysis in Section 1.1. A simulation analysis of changes in total statewide payments for each CPT code was conducted for Section 2.3, assuming four models for reducing price variation: setting prices at the statewide median; constraining prices below a ceiling at the statewide 80th percentile; setting prices above a floor at the 20th percentile; and constraining prices between a floor at the 20th percentile and a ceiling at the 80th percentile.

Potential savings in dollars were calculated using a process analogous to the inpatient cost savings simulation. In DHCFP's prior analysis of health care cost trends, physician and other professional services were found to represent 32 percent of total spending for privately insured health care in 2008.[4] Thirty-two percent of estimated total expenditures of $20 billion yielded an estimated $6.4 billion in privately insured spending on physician and other professional services in 2008. In order to produce dollar estimates of savings, the $6.4 billion in spending on physician and other professional services was multiplied by the estimated percent change in spending under the simulated price variation models.

4 See Figure A.2 in Deborah Chollet, et al., *Massachusetts Health Care Cost Trends, Part III: Health Spending Trends for Privately Insured 2006-2008*, February 2010. Available at: http://www.mass.gov/Eeohhs2/docs/dhcfp/r/cost_trends_files/part3_health_spending_trends_technical_report.pdf, accessed 5/22/2011.

3. Outpatient Price Variation Analyses

Four CPT codes were selected for the outpatient price variation analyses presented in Section 3 of the report by evaluating the CPT codes and modifier combinations that accounted for the largest volume of payments for outpatient hospital services, excluding payments for injections at hospital outpatient departments, evaluation and management payments where the quantity of service was unidentified or ambiguous, and surgical pathology services where the content of the service was unclear. The selected CPT codes are listed in Table 5; none of these CPT codes had modifiers.

Table 5: Hospital Outpatient CPT Codes Included in Price Variation Analyses

CPT Code	Description
G0202	Screening mammography, direct digital image, bilateral
77418	Radiation Oncology: Intensity modulated treatment delivery, single or multiple fields/arcs, via narrow spatially and temporally modulated beams, binary, dynamic, MLC, per treatment session
45378	Colonoscopy, flexible, proximal to splenic flexure; diagnostic, with or without collection of specimen(s) by brushing or washing, with or without colon decompression (separate procedure)
72193	Computed tomography, pelvis, with contrast materials(s)

The method used to analyze outpatient claims was the same as that used to analyze professional services claims. Only claims with a valid CPT code, paid on a fee-for-service basis, and corresponding to a non-zero and non-negative payment amount were retained for analysis. Outliers at the top and bottom of the distribution of payments were identified and discarded using the same method as for professional services.

For each CPT code, the total number of claims and total payments were calculated, as well as the minimum, mean, median and maximum prices across the statewide distribution for all claims. A simulation of potential cost savings for each CPT code was conducted under four scenarios to reduce price variation: setting prices at the statewide median; constraining prices below a ceiling at the statewide 80th percentile; establishing a floor at the statewide 20th percentile; or constraining prices between a floor at the 20th percentile and a ceiling at the 80th percentile.

4. Inpatient Quality

In order to measure the quality of health care delivered by hospital providers in the Commonwealth, existing, publicly reported quality measures were selected for each of the selected DRGs for analysis (Table 6). Effort was made to select available quality measures that were directly related to the selected DRGs. The selected quality measures consist of three domains: patient experience of care, process of care, and outcomes of care. More than one quality measure domain was used in the quality metric for most DRGs. In cases where more than one quality domain was used to assess the quality of care for a specific DRG, the patient experience domain accounted for 25% of the score and all other quality measure domains accounted for 75% of the score. In the case when patient experience is the only available domain, it accounts for 100% of the score. This method was adopted to align with the method used by the Centers for Medicare and Medicaid Services (CMS) in its value-based purchasing program.

Table 6 - Individual Quality Measures and Measure Sources by DRG (continued on next page)

DRG	Condition/Procedure	Corresponding Quality Measure		
		Description	Methodology Source	Data Source
139	Pneumonia	PN-2: Pneumococcal vaccination - hospital.	CMS	Clinical data/CMS
		PN-3b: Blood cultures performed in the emergency department prior to initial antibiotic received in hospital - hospital.	CMS	Clinical data/CMS
		PN-4: Adult smoking cessation advice/counseling - hospital.	CMS	Clinical data/CMS
		PN-5c: Initial antibiotic received within 6 hours of hospital arrival - hospital.	CMS	Clinical data/CMS
		PN-6: Initial antibiotic selection for community-acquired pneumonia (CAP) in immunocompetent patients - hospital.	CMS	Clinical data/CMS
		PN-7: Influenza vaccination - hospital.	CMS	CMS
		Readmissions	CMS	CMS
		Mortality	CMS	CMS
140	Chronic Obstructive Pulmonary Disease (COPD)	No condition-specific quality measures available; see measures for all conditions (below).		
190	Acute Myocardial Infarction (AMI)	AMI-1: Aspirin at arrival - hospital.	CMS	Clinical data/CMS
		AMI-2: Aspirin prescribed at discharge - hospital.	CMS	Clinical data/CMS
		AMI-3: angiotensin converting enzyme inhibitor (ACEI) or angiotensin receptor blocker (ARB) for left ventricular systolic dysfunction (LVSD)-hospital.	CMS	Clinical data/CMS
		AMI-4: Adult smoking cessation advice/counseling - hospital.	CMS	Clinical data/CMS
		AMI-5: Beta-blocker prescribed at discharge - hospital.	CMS	Clinical data/CMS
		AMI-7a: Fibrinolytic therapy received within 30 minutes of hospital arrival - hospital.	CMS	Clinical data/CMS
		AMI-8a: Primary percutaneous coronary intervention (PCI) received within 90 minutes of hospital arrival - hospital.	CMS	Clinical data/CMS
		Readmissions	CMS	CMS
		Mortality	CMS	CMS

Table 6: Individual Quality Measures and Measure Sources by DRG (continued from previous page)

DRG	Condition/Procedure	Corresponding Quality Measure		
		Description	Methodology Source	Data Source
194	Congestive Heart Failure (CHF)	HF-1: Discharge instructions - hospital.	CMS	Clinical data/CMS
		HF-2: Evaluation of left ventricular systolic (LVS) function - hospital.	CMS	Clinical data/CMS
		HF-3: angiotensin converting enzyme inhibitor (ACEI) or angiotensin receptor blocker (ARB) for left ventricular systolic dysfunction (LVSD) - hospital.	CMS	Clinical data/CMS
		HF-4: Adult smoking cessation advice/counseling - hospital.	CMS	Clinical data/CMS
		Readmissions	CMS	CMS
		Mortality	CMS	CMS
225	Appendectomy	No condition-specific quality measures available; see measures for all surgical procedures and conditions (below).		
263	Laparoscopic cholecystectomy	No condition-specific quality measures available; see measures for all surgical procedures and conditions (below).		
301	Hip joint replacement	No condition-specific quality measures available; see measures for all surgical procedures and conditions (below).		
302	Knee joint replacement	No condition-specific quality measures available; see measures for all surgical procedures and conditions (below).		
310	Intervertebral disc excision and decompression	No condition-specific quality measures available; see measures for all surgical procedures and conditions (below).		
313	Knee and lower leg procedures	No condition-specific quality measures available; see measures for all surgical procedures and conditions (below).		
403	Procedures for obesity	No condition-specific quality measures available; see measures for all surgical procedures and conditions (below).		
513	Uterine and adnexa procedures for non-malignancy except leiomyoma	No condition-specific quality measures available; see measures for all surgical procedures and conditions (below).		

Table 6: Individual Quality Measures and Measure Sources by DRG (continued from previous page)

DRG	Condition/Procedure	Corresponding Quality Measure		
		Description	Methodology Source	Data Source
540	Cesarean delivery	No condition-specific quality measures available; see measures for all surgical procedures and conditions (below).		
560	Vaginal delivery	PSI 18: Obstetric trauma – vaginal delivery with instrument	AHRQ	HDD
		PSI 19: Obstetric trauma – vaginal delivery without instrument	AHRQ	HDD
	All conditions	HCAHPS - Communication with nurses	CMS	Survey/CMS
		HCAHPS - Communication with doctors	CMS	Survey/CMS
		HCAHPS - Responsiveness of hospital staff	CMS	Survey/CMS
		HCAHPS - Pain control	CMS	Survey/CMS
		HCAHPS - Communication about medicines	CMS	Survey/CMS
		HCAHPS - Discharge information	CMS	Survey/CMS
		HCAHPS - Cleanliness of hospital	CMS	Survey/CMS
		HCAHPS - Quietness of hospital	CMS	Survey/CMS
	All surgical procedures	SCIP-Card-2: Beta-blocker used perioperatively	CMS	Clinical data/CMS
		SCIP-Inf-1a: Prophylactic antibiotic received within one hour prior to surgical incision - overall rate - hospital.	CMS	Clinical data/CMS
		SCIP-Inf-2a: Prophylactic antibiotic selection for surgical patients - overall rate - hospital.	CMS	Clinical data/CMS
		SCIP-Inf-3a: Prophylactic antibiotics discontinued within 24 hours after surgery end time - overall rate - hospital.	CMS	Clinical data/CMS
		SCIP-Inf-6: Surgery patients with appropriate hair removal - hospital.	CMS	Clinical data/CMS
		SCIP-Inf-9: Surgery patients whose urinary catheters were removed on the first or second day after surgery.	CMS	Clinical data/CMS
		SCIP-VTE-1: Surgery patients with recommended venous thromboembolism prophylaxis ordered.	CMS	Clinical data/CMS
		SCIP-VTE-2: Surgery patients who received appropriate venous thromboembolism prophylaxis within 24 hours prior to surgery to 24 hours after surgery.	CMS	Clinical data/CMS
		PSI 4: Death among surgical inpatients with serious treatable complications	AHRQ	HDD
		PSI 12: Postoperative pulmonary embolism or deep vein thrombosis	AHRQ	HDD
		PSI 15: Accidental puncture or laceration, secondary diagnosis field	AHRQ	HDD

Data Sources

For "patient experience" (based on surveys of adult hospital inpatients), CMS data available as of December 31, 2010 was used. Eight HCAHPS measures that are direct patient assessments of the experience of care (nurse communication, doctor communication, room cleanliness, pain control, explanations about medicines, home instructions, quietness in room, and receiving help quickly) were selected. These eight individual scores were averaged together to provide a composite patient experience score for each hospital.

For the "process of care" measures, CMS data for four clinical areas (heart attack, heart failure, pneumonia, and surgical care) available as of December 31, 2010 was used. Within each of these four clinical areas, a weighted composite average of the individual measures was calculated by using indirect standardization. The method for calculating the composite average is described further below.

For "patient outcomes" measures, two sources of data were used. Mortality and readmission rates for three clinical areas (heart attack, heart failure, and pneumonia) were obtained from CMS based on Medicare patients. These data were downloaded as of December 31, 2010, covering care from July 2006 through June 2009. Additionally, some Agency for Healthcare Research and Quality (AHRQ) indicators of mortality and patient safety, version 4.1B, were selected that related to the DRGs used in this analysis. These indicators were compared with DHCFP's hospital discharge database for fiscal year 2009.[5] While all AHRQ measures relevant to the selected DRGs were examined, only those showing stability over time were utilized in the analysis. The specific AHRQ measures included in this analysis are listed in Table 6.

Although data was used from the most recent available reporting period, some reporting periods covered more than 12 months. Also, in some cases, data was not available for all hospitals. If the hospital was missing a score for one of the quality measures, that measure was excluded from the hospital's score. If the hospital was missing data for more than one domain or had no data for one domain and a very low volume of observations in a second, it was similarly excluded from the analysis. Hospitals that did not serve as adult general hospitals (such as pediatric, specialty, and behavioral health facilities) were excluded from all analyses.

5 October 1, 2008 – September 30, 2009.

Composite Quality Scores

In cases where more than one measure domain was used to assess the quality of care provided for a DRG, a composite quality score was created. Each measure contributing to the overall score was converted to quality relativity by dividing the hospital's performance rate by the statewide average. A quality relativity of 1.0 matches the statewide average, and higher numbers indicate better performance. A relativity of 1.10, for example, indicates that the hospital performs 10 percent better than average on the measure. The relativities for each quality component were then averaged together using the weights described in Table 7, providing an overall weighted average relativity for each hospital for each DRG examined. This overall quality relativity was used to measure each hospital's relative performance for each DRG, as presented in Section 1.6 in the report.

Table 7: Range in Hospital Quality Relativity[1] by Measure Domain

	Aggregate Quality Relativity	
	Minimum	Maximum
Patient Experience (HCAHPS)	0.92	1.13
Surgical Process	0.85	1.03
Surgical PSI	0.96	1.04
Vaginal Delivery PSI	0.92	1.08
Pneumonia		
Process	0.79	1.04
Readmissions	0.95	1.04
Mortality	0.95	1.04
Acute Myocardial Infarction (AMI)		
Process	0.81	1.02
Readmissions	0.95	1.03
Mortality	0.96	1.05
Congestive Heart Failure (CHF)		
Process	0.67	1.06
Readmissions	0.96	1.05
Mortality	0.97	1.02

[1] The Quality Relativity was computed by dividing the hospital's performance rate by the statewide average. A relativity of 1.0 is average, and higher numbers indicate better performance. A relativity of 1.10, for example, indicates that the hospital performs 10% better than average on the measure. The relativities for each quality component were then averaged together, giving an aggregate relativity indicating the weighted-average performance for each hospital for each DRG examined. This aggregate relativity can be used to gauge each hospital's relative performance for each DRG.

Finally, standardized scores for each hospital's overall quality relativity were calculated for each DRG. The standardized score indicates how many standard deviations a score is above or below average. This was calculated as: $z = (x - \mu)/ \sigma$, where x is a raw score to be standardized; μ is the mean of the population; and σ is the standard deviation of the population. The quantity z represents the distance between the raw score and the population mean in units of the standard deviation. Z is negative when the raw score is below the mean and it is positive when the raw score is above the mean.

Standardized scores greater than 1.96 indicate performance that is two or more standard deviations better than average, which would be considered statistically significant at the $p<0.05$ level (95 percent confidence level). Similarly, scores below -1.96 indicate significantly worse than average performance.

For example, in order to create the pneumonia composite for a sample hospital, the hospital's performance was first compared to the state average performance for each of the process measures to calculate an expected numerator (denominator * state average rate), which is what the hospital would have had for the numerator for each process measure given the state average rate. The expected numerators were summed to get an aggregate expected numerator (i.e. 1,141 in this example). To get the aggregate process relativity, the actual aggregate numerator (i.e. 1,160) was divided by the aggregate expected numerator (see Table 8).

Table 8: Calculating Aggregate Process Relativity

Measure	Measure Description	Sample Hospital's Performance (%)	Denominator	Actual Numerator	MA Average Performance (%)	Expected Numerator	Quality Relativity
PN_2	Pneumonia Patients Assessed and Given Pneumococcal Vaccination	96	267	256	92.50%	247	
PN_3b	Pneumonia Patients Whose Initial Emergency Room Blood Culture Was Performed Prior To The Administration Of The First Hospital Dose Of Antibiotics	98	282	276	97.30%	274	
PN_4	Pneumonia Patients Given Smoking Cessation Advice/Counseling	100	60	60	98.10%	59	
PN_5c	Pneumonia Patients Given Initial Antibiotic(s) within 6 Hours After Arrival	98	239	234	98.00%	234	
PN_6	Pneumonia Patients Given the Most Appropriate Initial Antibiotic(s)	99	150	149	95.50%	143	
PN_7	Pneumonia Patients Assessed and Given Influenza Vaccination	95	195	185	94.30%	184	
	Totals for Pneumonia Process Measures		1,193	1,160		1,141	1.02

A similar process was used to calculate the patient experience domain aggregate relativity. Rather than comparing the individual measure numerators to an expected numerator, the hospital's performance scores were averaged and that average was compared to the state average score (see Table 9).

Table 9: Calculating Patient Experience Domain Aggregate Relativity

Measure	Measure Description	Sample Hospital's Performance (%)	MA Average Performance (%)	Quality Relativity
HCAHPS	Nurses "always" communicated well	79	-	-
HCAHPS	Doctors "always" communicated well	75	-	-
HCAHPS	Patients "always" received help as soon as they wanted	62	-	-
HCAHPS	Pain was "always" well controlled	71	-	-
HCAHPS	Staff "always" explained	58	-	-
HCAHPS	Yes, staff "did" give patients this information	91	-	-
HCAHPS	Room was "always" clean	76	-	-
HCAHPS	"Always" quiet at night	44	-	-
	Average of 8 HCAHPS Scores	69.5	70.2	0.99

The next step was to calculate the readmission domain relativity. However, for the sample hospital, no readmission data was available. That sample hospital's readmission relativity would therefore be reported as "NR," and it would not be included in the aggregate DRG quality relativity or standardized score.

To calculate the mortality domain relativity, the hospital's 30-day mortality rate was inverted to reflect a survival rate, and provide a consistent methodology for aggregating the rates (so that higher rates would reflect better performance across all measures). The hospital's survival rate was then compared to the state average survival rate to obtain the mortality domain relativity (see Table 10).

Table 10: Obtaining Mortality Domain Relativity

Measure	Measure Description	Sample Hospital's Performance (%)	MA Average Performance (%)	Quality Relativity
CMS Mortality	Pneumonia 30-day Mortality Rate	8.7	19.1	
	Pneumonia Survival Rate (100% minus Mortality Rate)	91.3	80.9	1.03

The relativities for each quality domain are presented below in Table 11.

Table 11: Quality Domain Relativities

	Quality Domain Relativities			
	Process	Patient Experience	Readmission	Mortality
Sample Hospital	1.02	0.99	NR	1.03

Table 12: Measure Domain Weighting in Overall Quality Performance Calculations by DRG

DRG	Condition/Procedure	Measure Domain Weighting
139	Pneumonia	Patient Experience Composite (25%) and 75% equally divided among CMS Pneumonia Readmission Rate, Pneumonia Mortality Rate, and Pneumonia Process Measures Composite
140	Chronic Obstructive Pulmonary Disease (COPD)	Patient Experience Composite (100%)
190	Acute Myocardial Infarction (AMI)	Patient Experience Composite (25%) and 75% equally divided among CMS AMI Readmission Rate, AMI Mortality Rate, and AMI Process Measures Composite
194	Congestive Heart Failure (CHF)	Patient Experience Composite (25%), and 75% equally divided among CMS CHF Readmission Rate, CHF Mortality Rate, and CHF Process Measures Composite
225	Appendectomy	Patient Experience Composite (25%) and Surgical Care Composites (75%)
263	Laparoscopic cholecystectomy	Patient Experience Composite (25%) and Surgical Care Composites (75%)
301	Hip joint replacement	Patient Experience Composite (25%) and Surgical Care Composites (75%)
302	Knee joint replacement	Patient Experience Composite (25%) and Surgical Care Composites (75%)
310	Intervertebral disc excision and decompression	Patient Experience Composite (25%) and Surgical Care Composites (75%)
313	Knee and lower leg procedures	Patient Experience Composite (25%) and Surgical Care Composites (75%)
403	Procedures for obesity	Patient Experience Composite (25%) and Surgical Care Composites (75%)
513	Uterine and adnexa procedures for non-malignancy except leiomyoma	Patient Experience Composite (25%) and Surgical Care Composites (75%)
540	Cesarean delivery	Patient Experience Composite (25%) and Surgical Care Composites (75%)
560	Vaginal delivery	Patient Experience Composite (25%) and AHRQ PSI Composite (75%)

To calculate the aggregate quality relativity, the various domain relativities were averaged according to the weighting guidelines in Table 12. For pneumonia, the Patient Experience relativity comprised 25 percent of the total aggregate, and the remaining domain relativities comprised 75 percent. Since no data was available for the readmission domain, the 75 percent portion is an average of the two remaining domain relativities with reported data. The resulting aggregate quality relativity is

$[(1.02+1.03)*0.75] + (0.99*0.25) = 1.01$

The standardized score was calculated according to the formula described above, where the statewide average is 1.00 and the standard deviation is 0.016. The resulting standardized score is

$(1.01- 1.00)/0.016 = 0.63$

Therefore, the sample hospital's aggregate pneumonia quality relativity indicates that they perform one percent better than other hospitals' average performance across various quality domains. The difference is not statistically significant.

5. Methodology for Calculating Public Payer Prices

For the 14 inpatient DRGs analyzed in Section 1 of the report, a hospital's severity-adjusted median price for Medicaid was calculated based on fee schedule rates. This approach incorporated methods similar to those used in the hospital severity-adjusted median payments for private payers. DRG specific payment rates were calculated that approximate what Medicaid would pay for those services for enrollees in Medicaid fee-for-service only.[6] Data on managed care enrollees was excluded from all Medicaid severity-adjusted payment calculations. These calculations used Medicaid rate data from hospital fiscal year 2009.[7]

Deconstructing the Medicaid Payment Amount for Inpatient Services

In Massachusetts, the Medicaid rate for acute inpatient services is the Standard Payment Amount per Discharge (SPAD). The rate applies to all acute inpatient non-psychiatric discharges. Each hospital is paid its own hospital-specific SPAD for each discharge, regardless of the patient's diagnoses or procedures.[8] The SPAD rate for each hospital can be found in Table 13.

Table 13: Medicaid SPAD Rates by Acute Hospital and Rate Year (continued on next page)

		2009	
	Acute Inpatient Hospital	10/1/2008-12/6/2008	12/7/2008-10/31/2009
1	Anna Jaques Hospital	$5,685.25	$5,162.37
2	Athol Memorial Hospital	$5,333.13	$4,842.19
3	Baystate Medical Center	$9,770.13	$8,686.01
4	Berkshire Health Care Systems	$8,982.85	$7,852.45
5	Beth Israel Deaconess Med Center	$9,830.78	$8,543.09
6	Boston Medical Center	$12,120.21	$9,393.12
7	Brigham and Women's Hospital	$11,197.56	$9,705.66
8	Signature Healthcare-Brockton Hosp.	$5,810.00	$5,227.26
9	Cambridge Health Alliance	$4,933.79	$4,455.86
10	Cape Cod Health Care	$6,438.43	$5,889.56
11	Caritas Good Samaritan Hospital	$6,433.46	$5,834.60
12	Caritas Norwood Hospital	$6,434.00	$5,850.54
13	Caritas Carney Hospital	$10,207.63	$8,912.60
14	Children's Hospital Boston	$14,682.01	$16,074.88
15	Clinton Hospital	$6,886.04	$6,249.80
16	Cooley-Dickinson Hospital	$6,433.63	$5,899.28
17	Dana Farber Cancer Institute	$16,620.30	$15,089.45
18	Beth Israel Deaconess/Needham	$6,042.97	$5,481.47
19	Emerson Hospital	$5,475.80	$5,098.81
20	Berkshire HCS - Fairview Hospital	$4,033.60	$3,689.34
21	Cape Cod HC - Falmouth Hosp.	$4,869.84	$4,458.28
22	Faulkner Hospital	$9,964.88	$8,666.52

6 Fee-for-service includes patients enrolled in the Massachusetts Medicaid Primary Care Clinician program.

7 Medicaid rates do not include payments for outliers, transfer cases, or any additional supplemental payments to hospitals.

8 The Massachusetts Medicaid program provides additional payments for stays over 20 days, called outlier payments. In FY2011, these payments are made only for pediatric cases. In addition, transfer cases are paid at a per diem rate for the transferring hospital, up to the hospital-specific SPAD.

Table 13: Medicaid SPAD Rates by Acute Hospital and Rate Year (continued from previous page)

		2009	
	Acute Inpatient Hospital	10/1/2008-12/6/2008	12/7/2008-10/31/2009
23	Baystate Med Center - Franklin	$4,781.14	$4,383.86
24	Hallmark Health Care	$6,111.09	$5,686.05
25	Harrington Memorial Hospital	$4,704.90	$4,276.20
26	Health Alliance Hospitals	$5,322.86	$4,828.52
27	Heywood Hospital	$4,718.63	$4,285.62
28	Caritas Holy Family Hospital	$5,581.13	$5,065.18
29	Holyoke Medical Center	$7,101.52	$6,516.24
30	Hubbard Hospital	$6,391.72	$5,807.26
31	Jordan Hospital	$5,081.36	$4,612.71
32	Lahey Clinic	$14,275.14	$13,194.96
33	Lawrence General Hospital	$5,871.74	$5,206.22
34	Lowell General Hospital	$5,229.44	$4,749.64
35	Marlborough Hospital	$7,995.06	$7,435.32
36	Martha's Vineyard Hospital	$4,637.23	$4,250.78
37	Baystate Med Center - Mary Lane	$4,360.45	$3,999.67
38	Mass Eye & Ear Infirmary	$11,769.68	$10,372.14
39	Mass General Hospital	$12,618.82	$10,878.79
40	Sisters of Providence-Mercy Hosp.	$6,799.74	$6,232.71
41	Merrimack Valley Hospital	$7,570.63	$6,876.36
42	Metrowest Medical Center	$5,536.16	$5,058.42
43	Milford Regional Medical Ctr	$5,430.59	$5,145.70
44	Milton Hospital	$6,670.79	$6,058.96
45	Morton Hospital and Medical Ctr.	$6,613.07	$6,003.11
46	Mount Auburn Hospital	$5,386.70	$4,894.28
47	Nantucket Cottage Hospital	$3,736.88	$3,424.85
48	Nashoba Valley Medical Center	$7,065.79	$6,578.87
49	New England Baptist Hospital	$13,492.30	$12,208.73
50	Newton-Wellesley Hospital	$6,599.65	$6,026.13
51	North Adams Regional Hospital	$4,857.79	$4,449.37
52	Noble Hospital	$9,213.05	$8,448.24
53	North Shore Medical Center	$6,280.14	$5,775.42
54	Northeast Corp.-Beverly Hospital	$5,721.39	$5,195.05
55	Quincy Medical Center	$8,398.22	$7,626.07
56	Saint Vincent Hospital	$8,323.38	$7,796.02
57	Saints Medical Center	$8,293.83	$7,538.34
58	South Shore Hospital	$6,572.25	$5,967.01
59	Southcoast Hospitals Group	$6,573.97	$5,970.67
60	Caritas St. Anne's Hospital	$7,393.58	$6,705.82
61	Caritas St. Elizabeth's Hospital	$9,804.02	$8,516.15
62	Sturdy Memorial Hospital	$6,544.83	$5,943.73
63	Tufts Medical Center***	$10,364.03	$9,134.56
64	U Mass Memorial Medical Center	$10,533.79	$9,240.31
65	Winchester Hospital	$5,597.74	$5,208.79
66	Wing Memorial Hospital	$6,928.24	$6,355.11
***	Tufts Medical Center - Pediatric	$17,296.27	$15,306.23

*** For Tufts Medical Center, a separate pediatric SPAD was utilized, and the SPAD noted for Tufts Medical Center is for non-pediatric cases only.

The following formula was used to calculate each hospital's SPAD:

((Statewide operating standard, adjusted for wage area) * prior year hospital case mix index) + (Statewide capital standard * prior year hospital case mix index) + Pass through per discharge amounts

The prior year hospital case mix index is the weighted average DRG weight of the hospital's Medicaid population.[9] The hospital's rate, therefore, was adjusted to account for its historical case mix acuity and severity mix.

To compare prices for specific DRGs, it is not appropriate to use the hospital-specific SPAD, as it has been adjusted to reflect the *entirety* of the hospital's case mix for the prior year. For the purposes of this report, DRG specific payment amounts were calculated for each hospital by substituting the prior year hospital case mix index with the DRG weight for the 14 selected DRGs. All other factors, such as wage area adjustment and pass through payments, were held constant.

This calculation is an approximate estimate of the amount Medicaid would pay for a particular DRG. As the SPAD method relies on prior year case mix, changes in hospital volume and rate policies may impact the amount the hospital will be paid for a particular case.

For example, assume Hospital A had three discharges in a prior fiscal year:

Table 14: Hospital A Case Mix

DRG (severity)	Case	DRG weight
225 (2)	Appendectomy	0.942
540 (1)	Cesarean Delivery	0.673
139 (3)	Other Pneumonia	0.803
	Hospital Case Mix (CMI)	0.806

The hospital's average case mix index is 0.806. As indicated in Table 15, the SPAD calculation for the rate year will include the 0.806 index:

Table 15: SPAD Calculation

		All Cases
1	Statewide Standard (wage adjusted)	$7,453.41
2	Hospital Case Mix (table 7)	0.806
3	Capital Standard	$492.72
4	Pass throughs	$87.50
5	Hospital SPAD	$6,492.08
	(Line 1 * Line 2) + (Line 3 * Line 2) + Line 4	

9 The DRG weights are the Massachusetts APR DRG version 26 weights.

To derive the DRG-specific payment amounts, DHCFP calculated a per case rate by replacing the hospital case mix (line 2) with the DRG-specific case weights, as shown in Table 16:

Table 16: DRG-Specific Case Rate

		DRG 225 (2)	DRG 540 (1)	DRG 139 (3)
1	Statewide Standard (wage adjusted)	$7,453.41	$7,453.41	$7,453.41
2	DRG Weight (Table 7)	0.942	0.673	0.803
3	Capital Standard	$492.72	$492.72	$492.72
4	Pass throughs	$87.50	$87.50	$87.50
5	DRG-Specific Case Rate	$7,572.76	$5,435.25	$6,468.24
	(Line 1 * Line 2) + (Line 3 * Line 2) + Line 4			

The result is a SPAD that is specific to that DRG and SOI.

Calculating a Hospital Severity-Adjusted Median Price for Medicaid

The distribution of discharges for Medicaid fee-for-service patients at each hospital by DRG and SOI was used in order to capture each hospital's severity distribution. The data was obtained from DHCFP's hospital discharge database, using discharges for October 1, 2008 through September 30, 2009. Data for the last quarter of 2009 were not available.

For each hospital and DRG, three numbers were used:

A = The hospital's weighted average median price was calculated as the average of the hospital's DRG and SOI specific SPAD amount weighted by the hospital's number of Medicaid fee-for-service discharges per SOI.

B = The hospital's expected median price per DRG was calculated as a weighted average of the statewide private payer median prices by SOI, with the weights calculated as the hospital-specific number of Medicaid fee-for-service discharges by SOI.

C = The statewide private payer median price was calculated across SOIs with at least five observations in hospitals with at least 30 observations of the DRG.

Each hospital's severity-adjusted median Medicaid price was calculated as (A/B)*C.

In order to facilitate comparison between private and public payers, Medicaid severity-adjusted median prices were calculated using the same statewide median prices by SOI and the same statewide median price used to calculate the private payer severity-adjusted median payments. In other words, both the private payer and Medicaid severity-adjusted prices by hospital represent how much that hospital was paid relative to the statewide median price paid by private payers.

Medicaid price relativities were also calculated as each hospital's severity-adjusted Medicaid median price divided by the median of all hospitals' severity-adjusted Medicaid median prices for the specified DRG category. While these numbers are not directly comparable to the private payer price relativities within each hospital, they do facilitate comparison of Medicaid severity-adjusted median prices between hospitals.

Additional Methods for Analysis of Medicaid Inpatient Prices

In some tables comparing Medicaid and private payer prices, the distributions of discharges by severity level are reported. For Medicaid, this is the distribution of Medicaid fee-for-service discharges reported in DHCFP's hospital discharge data. For private payers, this is the distribution of inpatient claims included in the calculations of the private payer severity-adjusted prices. In most cases, Medicaid managed care enrollees are excluded from Medicaid discharge distributions, to be consistent with the use of SPAD payments, which pertain only to fee-for-service enrollees. However, both Medicaid fee-for-service and Medicaid managed care enrollees are included in the hospital percent of discharges from Medicaid, in order to capture each hospital's relative leverage in negotiating prices with private payers.

Calculating Medicare Price Relativities for Inpatient Services

Medicare prices were calculated using claims payment information from the Health Safety Net (HSN) 2010 claims data. The HSN pays hospitals based on Medicare payment rates. Each hospital's per discharge price was derived for this analysis. After controlling for DRG weights, the hospital-specific Medicare prices are affected by adjustments (add-on payments) for geographic factors (including wages and cost of living), indirect medical education (IME), and disproportionate share status. Hospitals were arrayed by their Medicare prices to identify the median hospital. The Medicare price of each hospital was then divided by the price of the median hospital to create a price index, referred to as a price relativity similar to that for the private payer prices.

Public Payer Prices for Professional Services

For professional services analyzed in Section 2.2 of the report, private payer prices are compared with Medicaid and Medicare fee schedule rates. Medicaid fee schedule rates reflect those paid to physicians pursuant to 114.3 CMR 16.00, 17.00, and 18.00, effective December 1, 2008 through December 31, 2010. Medicare fee schedule rates reflect a simple average of the list prices for two Medicare localities: metropolitan Boston (locality code 3314301) and rest of Massachusetts (locality code 3314399) for 2009, and are taken from the Centers for Medicare and Medicaid Services.[10]

10 Available at: http://www.cms.gov/apps/physician-fee-schedule/overview.aspx, accessed 5/22/2011.

DIVISION OF
Health Care
Finance and Policy

Acknowledgments:
Analytic support provided by Mathematica Policy Research, Inc.
and Freedman Health Care

Division of Health Care Finance and Policy
Two Boylston Street
Boston, Massachusetts 02116

Phone: (617) 988-3100
Fax: (617) 727-7662

Website: www.mass.gov/dhcfp

Publication Number: 11-146-HCF-06
Authorized by Gary Lambert, State Purchasing Agent

Printed on Recycled Paper